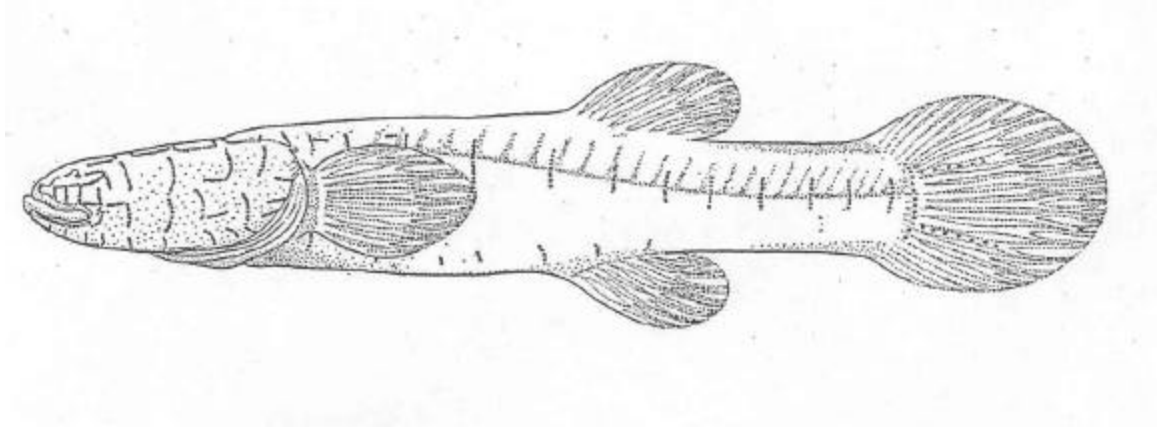


***Conservation Assessment
For
Southern Cavefish (*Typhlichthys Subterraneus*)***



(From Woods and Inger, 1957)

USDA Forest Service, Eastern Region

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Julian J. Lewis, Ph.D.
J. Lewis & Associates, Biological Consulting
217 W. Carter Avenue
Clarksville, IN 47129
lewisbioconsult@aol.com

MARK TWAIN NATIONAL FOREST



This Conservation Assessment was prepared to compile the published and unpublished information on Typhlichthys subterraneus. It does not represent a management decision by the U.S. Forest Service. Though the best scientific information available was used and subject experts were consulted in preparation of this document, it is expected that new information will arise. In the spirit of continuous learning and adaptive management, if you have information that will assist in conserving the subject community and associated taxa, please contact the Eastern Region of the Forest Service Threatened and Endangered Species Program at 310 Wisconsin Avenue, Milwaukee, Wisconsin 53203.

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EXECUTIVE SUMMARY

The Southern cavefish is designated as a Regional Forester Sensitive Species on the Mark Twain National Forest in the Eastern Region of the Forest Service. The purpose of this document is to provide the background information necessary to prepare a Conservation Strategy, which will include management actions to conserve the species.

The Southern cavefish is an eyeless, unpigmented troglobitic fish that occurs in two areas. The first, in the Ozark region of Missouri, Arkansas and Oklahoma, overlaps the Mark Twain National Forest. The cavefish is also found in a second area spanning parts of Alabama, Tennessee and Kentucky.

NOMENCLATURE AND TAXONOMY

Classification:	Class Osteichthyes Order Percopsiformes Family Amblyopsidae
Scientific name:	<u>Typhlichthys subterraneus</u>
Common name:	Southern cavefish
Synonyms:	<u>Typhlichthys osborni</u> <u>Typhlichthys wyandotte</u> <u>Typhlichthys eigenmanni</u>

In a revision of the Family Amblyopsidae, the synonymy presented above was established for Typhlichthys subterraneus and the species was redescribed by Woods and Inger (1957).

DESCRIPTION OF SPECIES

Typhlichthys subterraneus is an eyeless, unpigmented fish that was reported to reach a length of about 77 millimeters (Woods and Inger, 1957).

LIFE HISTORY

The most substantive information on the ecology of Typhlichthys subterraneus was published by Poulson (1963), from which the following information was abstracted. He reported that Typhlichthys subterraneus was typically found in food scarce environments. Of eight 800 liter plankton samples taken from near the mud-sand substrate of the fish in six different caves the following food materials were noted: 1-4 copepods, 0-5 rotifers, 0-11 ciliate protozoans, 0-3 algal fragments and 0-5 ostracods and nematode worms. Stomach contents demonstrated the larvae of tricopterans and tenebrionids, cladocerans, isopods and crayfish, although copepods comprised 60-90 per cent of the food by volume.

Concerning life cycle, in the fall of the year Typhlichthys subterraneus ova increased in size. Breeding apparently occurred in the spring, with juvenile fish occurring in the cave

streams in June and July. The following life history stages were reported for Typhlichthys subterraneus (age in months after birth):

First scales	3 months
Vent migration complete	5 months
First annulus	7-10 months
First reproduction	22-24 months
Oldest individuals	38-50 months

About 50 per cent of adult females were estimated to breed during the first year.

HABITAT

Typhlichthys subterraneus is an obligate cavernicole that typically occurs in pools in cave streams.

DISTRIBUTION AND ABUNDANCE

The range of Typhlichthys subterraneus is divided into two parts divided by the Mississippi River. The first is in the Ozark Plateau from northeastern Oklahoma through northern Arkansas and into southern Missouri, an area overlapping the Mark Twain National Forest. The second is part of the Interior Low Plateaus, comprising part of northern Alabama through Tennessee to the Mammoth Cave area of central Kentucky.

Of note, Typhlichthys subterraneus was also reported in the vicinity of the Hoosier National Forest from a well in Corydon, Indiana as Typhlichthys wyandotte (Eigenmann, 1905). Woods and Inger (1957) noted that the type specimens of Typhlichthys wyandotte had been lost and the type-locality destroyed. Concerning the later, a well-like entrance into a cave, on the property of a car dealership in Corydon, Indiana, was discovered recently and is speculated to be the type-locality of Typhlichthys wyandotte (Black, personal communication). That notwithstanding, the Indiana locality is generally considered to be invalid and Woods and Inger (1957) did not list the state as being within the range of Typhlichthys subterraneus. A year long study of the Binkley Cave System and associated caves in the Corydon area by Lewis and Sollman (1999) found only the related cavefish Amblyopsis spelaea. A survey of about 200 caves in the same drainage basin also failed to find Typhlichthys subterraneus (Lewis, 1998).

RANGEWIDE STATUS

Global Rank: G4 apparently secure; The global rank of G4 is usually assigned to species that have been recorded from over 100 localities. Although this species is known from sufficient localities to merit the rank of G4, its position in cave ecosystems as a predator suggests a lower (G3) rank.

Missouri State Rank: S2/S3 imperiled/vulnerable; The state rank of S2 is typically assigned to species that have been recorded from between 6-20 localities. The state rank of S3 is assigned to species that have been recorded from between 21-100 localities.

POPULATION BIOLOGY AND VIABILITY

Poulson (1963) reported that average population size is less in Typhlichthys subterraneus than in Amblyopsis species and population density increased with increasing cave adaptation of the species. The age frequency distributions of Typhlichthys subterraneus populations were found to be skewed toward younger age classes, with most being in the 0 or 1 year cohorts. Although Typhlichthys lives to be four years old, only 2.2 to 3.5 per cent of the populations censused at Shelta Cave, Alabama were in that age cohort. Population censuses for six caves yielded estimated that ranged from 7 – 150 fish per cave, with a mean population size of 41 fish.

POTENTIAL THREATS

No threats to any specific sites inhabited by Typhlichthys subterraneus were reported by any reviewer of this assessment.

There are numerous potential threats that might reasonably occur on national forest land due to the presence of Typhlichthys subterraneus in the restricted cave and groundwater environment. These include problems caused by activities outside of forest owned properties that may be imported by surface runoff or groundwater flow. Potential contaminants include (1) sewage or fecal contamination, including sewage plant effluent, septic field waste, campground outhouses, feedlots, grazing pastures or any other source of human or animal waste (Harvey and Skeleton, 1968; Quinlan and Rowe, 1977, 1978; Lewis, 1993; Panno, et al 1996, 1997, 1998); (2) pesticides or herbicides used for crops, livestock, trails, roads or other applications; fertilizers used for crops or lawns (Keith and Poulson, 1981; Panno, et al. 1998); (3) hazardous material introductions via accidental spills or deliberate dumping, including road salting (Quinlan and Rowe, 1977, 1978; Lewis, 1993, 1996).

Habitat alteration due to sedimentation is a pervasive threat potentially caused by logging, road or other construction, trail building, farming, or any other kind of development that disturbs groundcover. Sedimentation potentially changes cave habitat, blocks recharge sites, or alters flow volume and velocity. Keith (1988) reported that pesticides and other harmful compounds like PCB's can adhere to clay and silt particles and be transported via sedimentation.

There is a long history of mineral (e.g., zinc, lead) exploration and development in the southeastern and east central Ozarks and groundwater contamination is a potential threat. Dewatering of karst systems by well drawdown and mine pumping may also be a threat to groundwater species.

With the presence of humans in caves comes an increased risk of vandalism or littering of the habitat, disruption of habitat and trampling of fauna, introduction of microbial flora non-native to the cave or introduction of hazardous materials, e.g., spent carbide, batteries (Peck, 1969; Elliott, 1998). The construction of roads or trails near cave entrances encourages entry.

SUMMARY OF LAND OWNERSHIP AND EXISTING HABITAT PROTECTION

The following caves from which Typhlichthys subterraneus has been recorded (Missouri biospeleological database; Sutton, 1993; in press) are on the Mark Twain National Forest: Oregon County: Bliss Camp Cave, Boze Mill Cave, Dead Man Cave, Falling Spring Cave and Turner Spring Cave; Ripley County: Panther Cave; Shannon County: Brawley Cave.

Some of the caves on national forest land are protected from human visitation or habitat alteration simply by their physical condition and/or location. Bliss Camp Cave, Dead Man Cave, Posy Spring Cave, Roaring Spring Cave and Turner Spring Cave are all located within the Eleven Point National Scenic River boundary. Posy Spring and Roaring Spring caves are on private land that is covered by a Mark Twain National Forest scenic easement. No vegetation management occurs in the scenic river zone, except at developed recreation sites. Turner Spring Cave is gated and closed.

SUMMARY OF MANAGEMENT AND CONSERVATION ACTIVITIES

No species specific management or conservation activities are being conducted concerning Typhlichthys subterraneus in the Mark Twain National Forest.

Caves and springs located on the Mark Twain National Forest are subject to Forest Plan standards and guidelines for cave and spring protection and management. Perennial springs and spring branches will have a minimum 100 foot buffer zone within which any treatment will be modified on a case-by-case basis to: (1) meet state water quality standards and regulations, (2) comply with the riparian zone standards and guidelines identified under forest-wide 2500 (water and soil resource management) and 2600 (wildlife habitat management), (3) protect visual aspects, and (4) protect and enhance natural plant and animal communities.

Caves in the Mark Twain National Forest are recognized as specialized habitat areas and will be managed in accordance to the recommendations established by Gardner in 1982 in "An Inventory and Evaluation of Cave Resources of the Mark Twain National Forest". This includes the designation of an area of at least five acres centered on and completely surrounding a cave entrance for permanent old growth management. Insecticides and herbicides will not be used within the surface and known subsurface watersheds of caves utilized by the Indiana or Gray bats, Ozark cavefish, or any state endangered or rare species.

RESEARCH AND MONITORING

All reported observations of Typhlichthys subterraneus in Missouri, including the Mark Twain National Forest, are monitored in the Missouri Department of Conservation biospeleological database. The Cave Research Foundation is conducting a cave bioinventory in the Mark Twain National Forest.

RECOMMENDATIONS

Retain on list of Regional Forester Sensitive Species.

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